along much better without the latter, if forced to give up one of the two.

The lesson to be learned from this paper is that muscles must not be operated by rule of thumb methods such as, "advance the externus and cut the internus." Operators *must learn* that "rough stuff" is entirely out of place in a *delicate surgical procedure that aims to parallel the visual axes.* Muscle surgery is just as much a specialty in itself as plastic or neurologic.

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HANS BARKAN, M. D. (490 Post Street, San Francisco). — Doctor McCool's excellent summary of methods of diagnosis of the 'phorias and 'tropias needs no comment. It is logical, definite and to the point, and the beginner in ophthalmology could do no better than to systematically follow the routine he outlines.

We are also advocates of early operation, provided that a reasonably quick, satisfactory result is not obtained by glasses, fusion exercises, etc. Since adopting Doctor O'Connor's operative method we find that operation can be performed at early ages. No harm can be done and an opportunity for fusion training is obtained early in life. I would caution, however, to remember that the swing of the pendulum frequently goes too far in one direction and not to forget the many good results obtained in previous years by occasional carefully performed tenotomies and by systematic occlusion, glass-wearing, and exercises over longer periods. We have repeatedly seen third degree fusion established in children with no binocular vision before operation, when operated upon and trained afterward, even at the ages of seven to nine years, so that to obtain this desirable result it is not *always* necessary to operate at a very early age, although many times desirable, seldom meeting with any difficulties. The O'Connor operation, as such, we adopted as the most perfect mechanical means of straightening eyes at any age. With such perfect mechanical means the results have been highly satisfactory.

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DOCTOR MCCOOL (Closing).—In reply to Doctor O'Connor's criticism of the recession operation, I should like to say that if the sutures are placed so that they do not pierce the sclera, and only include the superficial fibers, the operation is perfectly safe and effective. One need not fear a loss in converging power unless the tendon insertion is set back too far. It is easier to do and, I think, quite as effective to use three mattress sutures of fine silk and insert them in the thick scleral tissue around the old stump of the tendon.

I do not think that convergence is weakened to any greater extent than it would be by the two-stage operation, and the advantage of one operation over two is not to be lightly considered.

The point brought out by Doctor O'Connor about the difficulty of persuading the patient that at times the eye that deviates is the wrong one to operate upon, is important. Of course we know that this is due to the well-known fact that patients prefer to fix with the paretic eye to make diplopia less disturbing.

The citation of one case of hyperphoria made comfortable by vertical prisms does not disprove my statement that there are certain cases of hyperphoria dependent upon ametropia and that these will disappear when the refraction is properly corrected.

With reference to the age at which operation should be performed, I think that Doctor O'Connor and I are in accord, with this exception: I do not believe that if the eyes do not become straight as soon as the glasses are worn and the atropin wears off that they will not become straight without operation. I believe glasses should be worn at least a year before we can say with certainty that they will not cure the squint.

THE RELATION OF PATHOLOGY TO LEGAL MEDICINE*

By ZERA E. BOLIN, M. D.
San Francisco

IT is my purpose to contrast briefly the status of legal medicine in Europe and America; to show the close relationship to pathology and to propose a scheme for the organization of an active department of legal medicine in the medical schools of the country, using as far as possible the existing conditions.

I take my definition of legal medicine from Draper's textbook: "Legal medicine is that department of medicine which teaches the application of every branch of medical knowledge to the needs of the law, whether civil or criminal."

THE CURRICULUM AND LEGAL MEDICINE

Having this definition in mind, it is obvious that every physician, whether he be a general practitioner, a specialist, or a laboratory worker, will have use for legal medicine in his work. Thus it follows that every medical student must be allowed the opportunity to obtain knowledge in the subjects treated upon in legal medicine. If this is true, where shall the student obtain such knowledge? There are those who say that each department in the medical school should consider and teach legal medicine. Let the professor of chemistry teach the detection of poisons, the identification of blood stains. Let the anatomist discuss the identification of human bones, the age and sex and proportions of the body, the effects of exposure and decomposition. Let the surgeon warn against malpractice in treating fractures and dislocations and fully describe knife and gunshot wounds, and automobile injuries. Have the obstetrician discuss the duration of pregnancy, the diagnosis of rape, abortion and delivery. Allow the pathologist to direct attention to the technique of medico-legal necropsies and describe trauma. It has been urged that these subjects be introduced in their proper place in each course, thus covering the field.

The refutation of the above proposals is that in present-day teaching the work is left undone. An instructor in a medical, as in other schools, teaches what interests him. If he dislikes a topic, it is treated briefly or not at all. Then, too, there are many subjects that are not properly placed in any course. Are these to be omitted even if they are as important as medical evidence in court, the identification of bodies, the rights of a physician and patient, and the liability of both?

Another group of critics who oppose a separate department of legal medicine in the curriculum will say that if a physician is well trained and knows his anatomy, chemistry, surgery and obstetrics, if he is honest and tells the truth, that he need not fear attending any court. This is true as far as general knowledge goes, but medical questions assume a very different aspect and

* From the department of pathology, University of California Medical School.

* Read before the Pathology and Bacteriology Section of the California Medical Association at the fifty-ninth annual session at Del Monte, April 28 to May 1, 1930.

reflect new and novel hues when viewed in the glare of the court than if seen in the mild light of the sickroom. Many a case could be recited of a physician well trained, and versed in the latest advances of medical science, who left the witness-stand mortified at the sorry presentation that he had made; a result of inability to prepare the facts for best consideration. Let me cite two notable cases. John Hunter, a man then at the head of his profession, had the finest of training and the soundest of medical knowledge and yet when asked to give evidence for the defense of a man accused of poisoning by cherry laurel water was of so little assistance to his side, and gave such poor answers to the court, that it created a great impression on his colleagues. A probable fortunate result was the establishment shortly after of the first course of legal medicine in Great Britain. On the other side of the picture is the experience of Robert Koch. He was at the time a country practitioner in a very small hamlet in Germany, but he probably had the normal German training in an institute of legal medicine. He was called as expert in a poisoning case and, due to his analysis and medical testimony, attracted such attention that it markedly influenced his career.

Then, too, a different set of observations is needed when the case assumes a medico-legal aspect. Let me remind you of the experience of Sir Astley Cooper. He was called to see a man who had been shot by an unseen person while sitting in a chair in his room. After having done what he could for the patient, he investigated the circumstances as to the direction of bullet, wound, chair, and so on, and came to the conclusion that the man had been shot by a left-handed person. This preliminary observation was enough to start the inquiry in the proper direction and led to the arrest, trial and conviction of the guilty person.

A SURVEY OF COURSES IN EIGHTEEN MEDICAL SCHOOLS

With facts such as these in mind, I scanned the catalogues of eighteen of the medical schools in America to ascertain, first, if regular courses in legal medicine had been offered; second, in what department they were taught and by whom; third, the number of hours and the subject-matter covered. Let me give you briefly the results.

Of these eighteen medical school catalogues, fifteen had announcements of courses in legal medicine or in an allied branch. The titles were as follows: Three called it "Legal Medicine"; four called it "Medical Jurisprudence"; two called it "Medical Jurisprudence and Toxicology"; two had no title at all; one called it "Social Hygiene, Criminology and Preventative Medicine"; "Medical Jurisprudence, Hygiene and Preventative Medicine"; "Medical Jurisprudence and Medical Ethics"; and "Medical Law."

The course was taught in a separate department in eight schools, in the medical department in two schools, and in a combination of physiology and physiologic chemistry in one school, and (note this well) in the department of pathology in only one school. Two schools had no data.

Even more astounding was the information concerning the teachers of the courses. Lawyers gave the courses in five schools. Physicians taught it in three schools; and a combination in one school. In one school, a course was given by lawyers and social service workers; in another, by any doctor chosen as a preceptor. The most confusing fact was to find one course taught by a bacteriologist who also taught protozoölogy and water analysis!

The subject-matter presented varied greatly. The following is a partial list: malpractice, relation of the physician and the law, regulation of the physician by law, court procedures, evidence, toxicology, examination of stains, professional rights, liability of physician, insanity, medico-legal postmortems, identity, and many more isolated subjects. Note where the subjects of interest to the pathologist rank in the list.

In addition to the above, let me state that in all the catalogues and references and by personal inquiry, there is presumably not a single medical school in this country where a student may be instructed in the duties that devolve on him when in contact with a crime or accident.

And, furthermore, all the subjects were taught by lecture only. Only one school used demonstrations, and another used its museum. The hours given to legal medicine varied from eight to thirty-two hours. It is usually given in the last year of the medical course.

In this country, we have not a single institute of legal medicine, and we are lacking in journals dealing with subjects of importance in legal medicine.

COMPARISON WITH COURSES IN EUROPEAN MEDICAL SCHOOLS

Let us now set against this rather dreary picture the conditions that obtain in Europe, with the exception of England.

With most European countries, the medical-legal institute is a force in the community. It has the status of a department in the university. It has a director who is a medical man and who is usually a pathologist. He has as assistants physicians trained in bacteriology, immunology, chemistry, toxicology, anthropology, and medical law. The institute coöperates with the police, the psychiatric clinic, and the prosecutors. Of the twenty-two European medico-legal institutes that have been covered by my reading, I will give you a complete picture covering the main facts as applicable for the universities in these countries.

The titles of the institutions are usually that of "The Institute of Legal Medicine" of the corresponding university.

Courses are taught in all of them. These range from the usual course of one semester of an average of about one hundred hours to a course of a year's duration and many more hours. These courses are compulsory and the state examination is composed in part of questions on medico-legal subjects. Other correlated courses are given. Graduate students are taken and trained along lines of their choosing. Courses are given to the

law students and graduates. The police are trained for special work in the institute. In some countries a man doing the work of a coroner in this country must have a diploma or certificate from one of these institutes. Close coöperation is had with the other departments in the university, especially pathology, anatomy, chemistry, obstetrics, psychiatry, and so forth.

The courses are taught by the director and his specially trained assistants in a logical way.

The subjects taught vary with the country, but usually comprise the following: medico-legal postmortems; identification of dead bodies; toxicology, especially as regards the symptoms, the postmortem, and the proper handling of specimens; thanatology; violent death; wounds, anthropology, especially of criminals; mental diseases and the law; perversions of sexual instinct; pregnancy, birth, delivery and abortion in their legal aspects; rape, marriage and divorce; compensation and industrial injuries; stains, especially of blood and semen; hair; electropathology; and many others.

These subjects are taught by lecture, demonstration, museum work, and assignment of special problems. Courts and asylums are visited. Necropsies are performed. Every proper pedagogical instrument is used.

However, this does not end the activities of these institutes. They act for the police and hold necropsies on all cases of violent and suspicious death. Likewise, they do the autopsies at the request of the civil sanitary authorities, especially in the case of epidemics. There are many examinations of material outside of their own surroundings, such as hair, stains, and suspected poisons. They examine the circumstances and referee in cases of industrial accidents and hazards. They examine sexual derelicts and cases of criminal abortion. They act as psychiatric investigators. Each institute has its museum, which includes wet and dry specimens, skeletons, skulls and bones, illustrative cases of wounds and injuries, photographs, anthropological specimens, and a large collection of criminal implements.

A library is included in each institute which varies from a few books to five thousand volumes. Here are found also the publications on medico-legal subjects from all the world.

In addition, research is carried on and papers prepared. The subjects vary with the country and the personality of the director. Usually the topics include criminal anthropology, laboratory technique, preventive measures against crime, industrial injuries, or the legal aspects of insanity.

The institute acts as adviser to the judge and courts, and is often called upon to give opinions upon cases having a medico-legal aspect.

There are several societies for the study of the problems of legal medicine, notably in Rome, Vienna, Berlin, and Paris.

HOW CAN THE AMERICAN SITUATION BE REMEDIED?

Having shown you these two contrasting pictures, what can be done to remedy the situation in our country and in England?

One of the severest criticisms of the coroner systems of handling medico-legal work is that it has led in no instance to the formation of institutes of legal medicine. We have, in the medical examiner system in New York and Massachusetts, potential institutes. Especially in New York, with a little financial aid, a beginning could be developed about the medical examiner system and the Bellevue Hospital. An attempt has been made in London to start an institute.

In America, we are confronted with three things that hold back the formation of institutes in the medical schools. These are: first, public indifference; second, lack of financial support by the political powers; and third, the coroner system.

The public indifference can only be overcome by showing the necessity for such an institute and by proper publicity. If an institute could be started, however feebly at first, and its qualities in several outstanding cases be proven, the financial aid and the publicity would follow.

The coroner's office is quite another matter. That type of office, with its forms of investigation, is seemingly firmly planted on our political organizations. Although both lawyers and physicians know of its incapacity to function properly, it will take years of work with the public and politicians before a better system can be instituted. However, since a beginning has been made in New York and in Massachusetts, and in 1927 in New Jersey, it may be possible to do it gradually for other states. But we cannot wait for that.

A PROPOSED PLAN

I would suggest the following plan to the medical schools, especially those located in the larger urban centers:

First: The appointment of a pathologist as organizer of an institute of legal medicine. This would necessarily, at first, be a part of the department of pathology, since most of the material and laboratory assistance would come from this department.

Second: Allow this director to organize a provisional department, using the personnel of the other departments of the medical school. Each of the departments of medicine, obstetrics, psychiatry, psychology, bacteriology, chemistry, surgery, etc., could loan an interested man to the new institute for as much time as necessary to carry out his part of the program of the institute.

Third: With the advice of the judges and bar association, appoint one or more graduates in law who are interested in legal medicine and who would coöperate on the legal side.

Fourth: Form connections with the police department and offer the services of the institute in their problems, asking in exchange the opportunity of using such of their material for teaching as is necessary.

Fifth: Offer the services of the institute to the coroner's office or ask the coroner to appoint the director or some other representative of the institute on his staff as pathologist.

Sixth: Offer the institute and its facilities to the State Compensation Board, insurance com-

panies and like organizations. They could get unbiased reports which could be a source of income.

The teaching in an institute of this kind could be correlated by the head of the organization. It could be concentrated in a half year, or diffused through several years. The connections made with the police and coroner would allow the students to see the results of accidents and crime. They could get an idea of court procedures and evidence.

A proper course given in the proper spirit would do marvels in overcoming the fear of the average medical graduate for courts and legal people.

As each department would be called upon to teach or decide on a point only infrequently, no great burden would be placed on any department.

The cost to the university would be very small until the work became so onerous as to crowd the department in which the institute was domiciled, but by that time interest probably would have been aroused sufficiently to insure the financing of a proper building.

This scheme, for what it is worth, is offered in an endeavor to fill a need in our medical school curriculum. It is very flexible and inexpensive to start. It requires a properly spirited man to head it. He must be willing to coöperate with various types of people and organizations. He must be willing to start at the bottom, and make sacrifice for the ends to be achieved.

University of California Medical School.

HEAD INJURIES—THEIR TREATMENT*

By EDMUND J. MORRISSEY, M. D.
San Francisco

DISCUSSION *by E. B. Towne, M. D., San Francisco; Mark Albert Glaser, M. D., Los Angeles.*

THE treatment of head injuries will be limited in this paper to the immediate treatment, but in the short time allotted it will be possible to discuss only a few of the essential points.

In the treatment of head injuries it is most important to remember that we are chiefly concerned with the amount of cerebral contusion, that is, brain damage and not the fracture *per se*.

It is not uncommon to see patients who have long linear fractures in which there is little evidence of brain damage and, on the other hand, patients with severe cerebral contusion and with no demonstrable fracture.

ROENTGEN-RAY EXAMINATION

For this reason it is a mistake to order the average patient who has had severe intracranial trauma for x-ray examination because: first, these patients as a rule are suffering from shock; second, as stated before, we are interested in treating the brain damage and not the fracture, unless the fracture is depressed, in which case the diagnosis as a rule may be made without x-rays; and third, if the patient presents evidence of intracranial hemorrhage the selection of the operative site will be determined from the clinical and not the x-ray findings.

From the foregoing the writer does not wish to convey the impression that x-rays of the skull are not necessary. On the contrary, they are very important as they help in the prognosis, are an added indication of the severity of the blow received, and occasionally show depressed fractures that cannot be found on clinical examination, and by means of a pineal shift one may diagnose an intracranial hemorrhage.

As regards the x-ray examination of head injuries the following conclusions may be drawn:

First: A certain small percentage of fractures cannot be shown by x-ray examination.

Second: One is not justified in making a diagnosis of no fracture of the skull from only one or two, or even three, x-ray views. To reach a proper conclusion it is necessary to have at least lateral plates of each side, frontal and occipital, preferably stereoscopic views. Even this is not sufficient, as the writer has had a series of cases in which only by taking mastoid plates was it possible to demonstrate fractures of the petrous portion of the temporal bone. In fact this has occurred with such relative frequency that at present mastoid plates are included in our routine examination of the skull in acute head injuries. This is especially true if there is a history of bleeding from the external auditory meatus.

Third: The extent of the fracture cannot be determined by x-ray examination. At either operation or postmortem examination that which often appears as a short linear fracture in the x-ray plate will be seen to extend a much greater distance.

Prognosis.—In fractures extending across the cribriform plate into ethmoid cells and associated with the escape of cerebrospinal fluid, the prognosis is poor. In fractures extending through the petrous portion of the temporal bone and resulting in bleeding or the discharge of cerebrospinal fluid from the external auditory meatus, the prognosis is fair.

The reason for the prognosis being so much worse in fractures through the cribriform plate and ethmoid cells is due to the presence of pathological organisms in the sinuses and nasal cavities, which either by direct extension or especially by the explosive force of coughing or sneezing enter the subarachnoid spaces and so causing a meningitis or cerebral abscess.

For this very reason irrigation or spraying of these cavities in the presence of cerebrospinal fluid drainage is extremely dangerous and should not be done.

INTRACRANIAL PRESSURE

The major problem in the care of head injuries after recovery from shock is the treatment of increased intracranial pressure.

As a rule two conditions contribute to this increased intracranial pressure:

First: Brain edema, which is the cause in at least 90 per cent of the cases.

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